Utah Department of Transportation

Concept Phase Design Process

February 2006

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Concept Kickoff # 50C

Deliverables

- ❑ Concept Team List
- ❑ Project File
- ❑ Locked Project PIN

Distribution

- ❑ Project File
- ❑ Concept Team Members

TASK	RESPONSIBLE PARTY
	Project Manager
❑ Set up Project Number (PIN) in ePM	X
❑ Physically Inspect Project	X
❑ Request Operational Safety Report	X
❑ Select Members to Serve on Concept Team	X
❑ Obtain Project Information	X
❑ Concept Phase Kick-off Meeting	X
❑ Negotiate Schedule and Lock PIN	X

Set up Project Identification Number (PIN) in ePM

If a PIN has not been established for the project, the Project Manager e-mails the STIP Development Coordinator and requests a new PIN. The STIP Development Coordinator will need to know:

- ❑ Project Description
- ❑ Project Location
- ❑ Funds needed to complete the Concept Report (approximate)

The STIP Development Coordinator creates a Master PIN for the project and assigns a PIN for the concept phase of the project. In addition, s/he will assign a Project Number, a Job/Proj code, and open the 04M sub-phase of the Job/Proj.

In order for the STIP Development Coordinator to allocate any funds to the project(s), s/he will need a form R-709. The Project Manager completes the form and e-mails it to the STIP Development Coordinator.

Physically Inspect Project

The Project Manager and the Preconstruction Engineer visit the project site to become familiar with the need for the project and to discuss who will be involved on the concept team.

Request Operational Safety Report

Request the Operational Safety Report (OSR) from central Traffic and Safety. Distribute the OSR to the Region Traffic Engineer for Activity 64C.

Select Members to Serve on Concept Team

The Project Manager, with the Region Preconstruction Engineer, selects members to serve on the concept team based on the type of project as defined in the current Commission approved STIP and the type of expertise required to develop the Concept Report. Potential members of a project Concept Team are:

CENTRAL SUPPORT PERSONNEL	REGION PERSONNEL
Right-of-Way	Project Manager
FHWA[1]	Right-of-Way
Geotechnical Division	Traffic and Safety
Structures Division	Environmental
Value Engineering [2]	Utilities
Context Sensitive Solutions	Hydraulics
Region Planning Representative	Region Preconstruction Engineer
ITS	Region Materials Engineer
Central Hydraulics	Region Construction Engineer
	Region Operations Engineer
	District Engineer
	Resident Engineer
	Design Engineer
	Region Pavement Management Engineer
	Region Landscape Architect
	Region Public Involvement Coordinator
	Maintenance Area Supervisor
	Local Government
1 – Mandatory involvement on all non-stewardship projects (asterisk)	
2 – Mandatory involvement if the project estimate is over $10 million	

Obtain Project Information

- ❑ Discuss the project with the Region Director.
- ❑ Talk to the Region Planning representative about the project as defined on the STIP. Request a copy of the corridor study (if available,) and any project files.
- ❑ Contact the Region Pavement Management Engineer to obtain any existing information about the pavement condition.

Concept Phase Kick-off Meeting

The Project Manager will bring the Concept Team together to share existing information gathered and assign tasks necessary to complete the concept report. This meeting is not intended to scope the project. The goal of this meeting is to accomplish the following objectives:

- ❑ Determine Project Objectives
- ❑ Determine Activities to be completed in the concept phase
- ❑ Distribute any preliminary information obtained from Region Management, Planning, Pavement Management, etc.

This meeting will last approximately 30 minutes to 1 hour.

Negotiate Schedule and Lock PIN

After the kickoff meeting, meet with the appropriate Functional Managers to negotiate hours and days to complete all required concept activities. Each Functional Manager locks activities for their group once the hours and days have been negotiated. Once all of the planned activities for the concept phase are locked, the Project Manager will lock the PIN. The Project Manager will have the ability to change the status of the concept activities from planned to active only after the PIN is locked.

PIN activity budget locking and activity status updates are done on ePM Screen 220, "Activity Status."

Determine Environmental Concept # 52C

Deliverables

- ❑ Proposed Environmental Concept with cost estimate

Distribution

- ❑ Project File
- ❑ Project Manager
- ❑ Region Environmental Manager

TASK	RESPONSIBLE PARTY
	Region Environmental Manager
❑ Identify Study Area	X
❑ Write Preliminary Environmental Concept	X

Identify Study Area

Identify potential environmental resources that may affect project concept. Select a study corridor large enough to accommodate minor design changes, reasonable design alternatives, drainage, detours, utility relocations, potential equipment staging areas, access roads, stockpile locations, and material borrow or waste sites.

Write Preliminary Environmental Concept

The Region Environmental Manager identifies any anticipated environmental factors that may affect design concept and provides a cost estimate and estimated time for mitigation. By using the preliminary environmental review checklist, determine the type of environmental document required for the project. Base environmental factors and cost estimates primarily on existing information during the site visit. Detailed investigations are not conducted during the concept phase of project development.

The final concept level review document includes, at a minimum:

- ❑ Potential Resource Identification and Mitigation
- ❑ Potential Environmental Cost (time and money)
- ❑ Potential Environmental Classifications (Categorical Exclusion II or III)
- ❑ Permits Needed

Develop Concept Plans # 54C

Deliverables

- ❑ Existing Roadway Inventory
- ❑ Concept Plans

Distribution

- ❑ Project File
- ❑ Concept Team Members

TASK	RESPONSIBLE PARTY
	Design Engineer
❑ Determine Possible Drainage and Hydraulic Elements	X
❑ Determine Project Design Criteria	X
❑ Perform Geometric Inventory	X
❑ Prepare Concept Plans	X
❑ Recommend Design Exceptions	X

Determine Possible Drainage and Hydraulic Elements

Identify existing drainage and hydraulic elements within the project area and their condition. Evaluate whether any detention/retention basins, curb and gutter, storm drains, cross drains, and outfalls need repair. Check with maintenance to verify existing system condition. Due to an aging cross culvert system, physically inspect all project cross culverts to determine remaining service life. Timely replacement will prevent future damage. Consider culvert lining or replacement on projects over older highway segments.

Review existing drainage conditions on the project. Region staff will typically determine storm drain and detention system requirements for the project. This includes the sizing, location, routing, detention, or retention of storm water. This may also include selecting the appropriate storm water treatment. Central Hydraulics is available upon request to help with this review.

Prepare a prioritized list of proposed hydraulic and drainage improvements to review during the concept meeting (Activity #72C.)

Determine Project Design Criteria

Complete the Project Design Criteria table from the Roadway Design Manual of Instruction with recommended design standards for the project.

Perform Geometric Inventory

Compile maps (Natural Resources Conservation Service, US Forest Service, US Geological Survey, Utah Automated Geographic Reference Center) and plans or sketches showing existing alignments and alternatives, typical sections, and project limits. Gather other information such as as-built plans, existing aerial photography, and the existing conditions inventory report as needed. Consider the 12 critical elements and 13 design waivers when performing the inventory.

Prepare Concept Plans

Concept plans consist of existing or proposed drawings and designs for use in the Project Concept Meeting. Sources for these plans may include "As-Constructed" drawings, project files, aerial photography, and USGS maps.

Concept plans contain the general location of the proposed project and may also include previous project numbers, mile posts, route number, stationing, Township and Range location (for Right-of-Way) and other information for locating the limits of the project. Concept plans contain details of the existing roadway and cross section. Concept plans also include proposed roadway typical sections, number of lanes, widths, clear zones, design speed, and sight distances.

Determine if geotechnical study will be needed for roadway design. Contact the Geotechnical Division if geotechnical involvement will be needed, to determine the scope and schedule of the study. Include these costs as an item in the roadway cost estimate.

Recommend Design Exceptions

Determine if any of the 12 critical elements or 13 design waivers have deficiencies and if they will be corrected with this project based on available information. Recommend any design exceptions for deficiencies not corrected during the project.

Prepare and submit any design exceptions that will require the project to be significantly impacted or abandoned if not approved. Include approvals for these design exceptions in the final concept report.

Determine Right-of-Way Concept # 56C

Deliverables

- ❑ Project Right-of-Way Map and Cost Estimate

Distribution

- ❑ Project File
- ❑ Project Manager

TASK	RESPONSIBLE PARTY
	Region Right-of-Way Engineer
❑ Compile Existing Information	X
❑ Identify Possible Right-of-Way Impacts	X
❑ Produce Concept Right-of-Way Map	X

Compile Existing Information

Compile maps, plans, or sketches showing existing alignments and alternatives, typical sections, and project limits. Work with the Design Engineer to obtain proposed alignments and concept plans. Gather other information as needed. Some potential sources are shown below:

ENTITY	INFORMATION REQUESTED
Federal Agencies US Forest Service USGS Bureau of Land Management	USGS Quad Maps Mining Claims
State Agencies UDOT Department of Natural Resources	Existing Project Plans Project Location Map with Project Limits Mining Claims
Local Governments County Recorder Local Government	County Ownership Plat Maps Existing Utility Maps Mining Claims
Other Contacts Utility Companies Railroad Companies	Existing Railroad Maps Existing Utility Maps

Identify Possible Right-of-Way Impacts

Prepare preliminary information for the concept report on how the highway improvement affects land owners, potential relocations, mining claims, buildings, highways to be abandoned, or frontage roads to be removed from the State system and placed in local jurisdiction, etc.

Produce Concept Right-of-Way Map

Produce a map and report that contains:

- ❑ Land use adjacent to the project with approximate cost to acquire
- ❑ Number of parcels and approximate locations
- ❑ Possible utility right-of-way conflicts
- ❑ Potential sources of hazardous waste

Preliminary Pavement Design # 58C

Deliverables

- ❑ Existing Pavement Condition Report

Distribution

- ❑ Project File
- ❑ Project Manager
- ❑ Region Materials Engineer
- ❑ Central Pavement Management Engineer
- ❑ Engineer for Materials

TASK	RESPONSIBLE PARTY
	Region Pavement Engineer
❑ Perform Materials Evaluation	X
❑ Determine Possible Project Alternatives	X

Perform Materials Evaluation

Determine the condition of the existing pavement using system-level pavement management data. Prepare a preliminary testing strategy to supplement existing data. Review ground penetrating radar information to aid in selecting core locations. Take 10-15 cores, slabs or both from the project area and perform minimal lab testing to help determine the condition of the pavement. Determine the following information during this task:

- ❑ Pre-testing (Pavement Management Data) including project level coring and materials testing
- ❑ Falling Weight Deflectometer or other structural measurement
- ❑ Rut measurements
- ❑ Ride index/IRI
- ❑ Cracking, type and extent
- ❑ Skid index
- ❑ Traffic data
- ❑ Economic factors for life cycle cost analysis
- ❑ Core data

Determine Possible Project Alternatives

Review corridor strategy or project concept for pavement. Recommend alternative solutions to be further evaluated during Activity #76C, along with any significant factors to be considered in the alternative analysis, life-cycle cost information for the alternative selection, and any additional testing needed to assess pavement condition or select alternatives.

Determine Public Involvement Concept # 60C

Deliverables

- ❑ Public Involvement Plan

Distribution

- ❑ Project File
- ❑ Public Involvement Coordinator

TASK	RESPONSIBLE PARTY
	Public Involvement Coordinator
❑ Identify Stakeholders	X
❑ Develop Public Involvement Plan	X

Identify Stakeholders

The Public Involvement Coordinator, with the assistance of the Project Manager, identifies both the internal and external stakeholders for the project.

Develop Public Involvement Plan

The Public Involvement Coordinator, with the assistance of the Project Manager, develops a public involvement plan that enables all stakeholders, including the general public, to provide input on the project.

The public involvement plan will contain the plans documenting public hearings, scoping meetings, and other public gatherings that promote an open exchange of information and ideas between the public and the transportation decision-makers.

The public involvement document:

- ❑ Provides a means for early and continuous public involvement
- ❑ Documents the desired level of acceptance for each project phase
- ❑ Includes a list of stakeholders (from planning)
- ❑ Includes any CSS commitments
- ❑ Documents commitments made to stakeholders
- ❑ Provides a means for the commitments made to stakeholders to be passed on throughout the project life

- ❑ Provides a means for renewed dialogue if it is found necessary to alter commitments made to stakeholders
- ❑ Develops or update the existing public involvement project file that incorporates the public involvement plan
- ❑ Includes documentation of public involvement efforts from the program development phase

Determine Structures Concept # 62C

Deliverables

- ❑ Structures Inventory and Recommendation Report
- ❑ Recommended Structures Treatments including Cost Estimate

Distribution

- ❑ Project File
- ❑ Project Manager

TASK	RESPONSIBLE PARTY		
	Structures Division	**Geotech Division**	**Central Hydraulics**
❑ Recommend Structures Treatment	X		
❑ Determine Geotechnical Involvement		X	
❑ Determine Hydraulic Elements			X
❑ Determine Scour Critical Program			X

Recommend Structures Treatment

Using information from the Structures Inventory and Recommendation Report, write recommended treatments for all structures, bridges, box culverts, and walls within the project limits. Include in this report a prioritized list of improvements with estimated costs.

Determine Geotechnical Involvement

Determine if a geotechnical study will be needed for structures design such as embankment, walls, etc. Contact the Geotechnical Division if geotechnical involvement will be needed, to determine the scope and schedule of the study. Include these costs as an item in the structures cost estimate.

Determine Hydraulic Elements

New bridges and existing bridges being replaced need to have a hydraulic concept prepared. This includes: FEMA Flood Plain, Capacity, Channel Alternation, etc. The two major types of projects are listed below. Contact the Central Hydraulics Division if hydraulics

involvement is needed, to determine the scope and schedule of the study. Include these costs as an item in the structures cost estimate.

- **Major Structure/Stream Alteration**
  Structures with a combined span of 20 feet or greater must be tracked within the UDOT structures database and must be coordinated through the Structures Division. Central Hydraulics will provide oversight of structure hydraulics water crossings. Include Central Hydraulics on any project that will possibly need stream alterations.

- **Minor Structure**
  Minor structures are structures with spans less than 20 feet. Region Hydraulic Engineers take the lead when preparing a concept for minor structures over water. Central Hydraulics is available to help with this task. Complex projects may also require the involvement of Central Hydraulics for items such as irrigation, water rights, wetlands, etc.

Determine Scour Critical Program

Provide a hydraulic study/concept for all repairs to scour critical bridges. Determine if the structure is classified as Scour Critical in the NBIS Structures Inventory and Appraisal. Contact Central Hydraulics to determine if the structure is scour critical and eligible for special funding.

Determine Traffic and Safety Concept # 64C

Deliverables

- ❑ Recommended Traffic and Safety Improvements with cost estimate

Distribution

- ❑ Project File
- ❑ Project Manager

TASK	RESPONSIBLE PARTIES	
	Central Traffic and Safety	**Region Traffic and Safety Engineer**
❑ Produce Operational Safety Report	X	
❑ Recommend Traffic and Safety Improvements		X

Recommend Traffic and Safety Improvements

After receiving the OSR, prepare a prioritized list of recommended improvements to Traffic and Safety elements. Work with the Design Engineer to produce a cost estimate. Possible elements to address are:

- ❑ Sidewalk widths
- ❑ Signing and striping
- ❑ Traffic signals
- ❑ Pedestrian ramps
- ❑ Lighting
- ❑ Access management
- ❑ Bike and pedestrian facilities
- ❑ Barrier and guardrail

Develop ITS Concept # 66C

Deliverables

- ❑ Existing ITS element inventory
- ❑ Recommended improvements with cost estimate

Distribution

- ❑ Project File
- ❑ Project Manager

TASK	RESPONSIBLE PARTY
	ITS Project Manager
❑ Inventory of Existing ITS Elements	X
❑ Recommend ITS Improvements	X

Inventory of Existing ITS Elements

Locate all existing ITS elements in the general vicinity of the project. Generate a location map with the elements mapped.

Recommend ITS Improvements

Recommend new ITS installations to be completed during the project. These recommendations will include estimated cost of each improvement. Prioritize these recommended improvements should be prioritized in the final recommendation report. Possible elements to include in this report are:

- ❑ Conduit or new network infrastructure
- ❑ Traffic Signal Interconnect
- ❑ Closed Circuit Television (CCTV) Camera
- ❑ Road Weather Information System (RWIS)
- ❑ Highway Advisory Radio (HAR)
- ❑ Variable Message Sign (VMS)
- ❑ Ramp Metering
- ❑ Traffic Management Systems (TMS) Stations

Determine Utility and Railroad Concept # 68C

Deliverables

- ❑ Existing Utility Inventory
- ❑ Estimated Relocation Costs

Distribution

- ❑ Project File
- ❑ Project Manager

TASK	RESPONSIBLE PARTY
	Region Utility and Railroad Coordinator
❑ Inventory Existing Utilities	X
❑ Estimate Utility Relocation Costs	X
❑ Determine Railroad Involvement	X

Inventory Existing Utilities

Locate major utilities within the project limits. The following list (not all-inclusive) is a guide for utilities to include in an inventory.

- ❑ Communication Lines
- ❑ Sewer Lines
- ❑ Water Lines
- ❑ Gas Lines
- ❑ Petroleum Pipelines
- ❑ Overhead/Underground Power
- ❑ Cable Lines
- ❑ Irrigation

Estimate Utility Relocation Costs

For all utilities found, determine the approximate costs to relocate utility.

Determine Railroad Involvement

Determine the level of Railroad involvement,if any, and the approximate timeline and cost for improvements.

Determine Miscellaneous Concept # 70C

Deliverables

- ❑ Miscellaneous Project Details

Distribution

- ❑ Project File

TASK	RESPONSIBLE PARTY
	Project Manager
❑ Determine Project Delivery Method	X
❑ Determine Additional Analysis Needs	X
❑ Investigate Potential Enhancements	X
❑ Recommend Project Schedule	X

Determine Project Delivery Method

Analyze potential risks and benefits to various delivery methods for the project. Evaluate whether contract should incorporate an innovative contracting method such as A+B, design-build, lane rental, CMGC, etc.

Determine Additional Analysis Needs

Recommend any additional analysis (Cost Estimate Validation Process (CEVP®,) Value Engineering (VE,) Accelerated Construction Technology Transfer (ACTT,) etc.) that may benefit the project.

Investigate Potential Enhancements

Consider and recommend any trails or pathways or Aesthetic Improvements that may be eligible for Region Designated Enhancement funding that can be incorporated into the project. Contact Local Governments to see if there are any possible enhancements or betterments to include in the project. Coordinate with Local Governments to secure Transportation Enhancement Funds. Coordinate with local Transit Authorities and consider multi-modal transit solutions or improvements.

Recommend Project Schedule

Determine which activities are necessary to advertise the project. Estimate time required to complete all design activities needed. Determine the appropriate time of year to advertise the project. Prepare a recommended advertisement date to discuss during the Project Concept Meeting.

Hold Concept Meeting # 72C

Deliverables

- ❑ Concept Report Assignments

TASK	RESPONSIBLE PARTY
	Project Manager
❑ Draft Concept Report	X
❑ Schedule and Lead Concept Meeting	X

Draft Concept Report

Prior to the Concept Meeting the Project Manager will collect the work products from the previous activities (52C, 54C, 56C, 58C, 60C, 62C, 64C, 66C, 68C, 70C.) Distribute this information to the concept team prior to the meeting. The Design Engineer can use the information to fill out the Concept Report Form and distribute to the team prior to the concept meeting.

Schedule and Lead Concept Meeting

The Project Manager schedules the concept meeting and distributes a copy of the information available to all Concept Team Members. Each Concept Team Member reviews the documentation prior to the meeting.

The team then meets to discuss the project parameters and recommendations from the various areas participating in the concept phase. During the meeting the team will discuss aspects of the project and finalize the project objectives.

Final Concept Report # 74C

Deliverables

- ❑ Concept Report

Distribution

- ❑ Project File
- ❑ Preconstruction Engineer
- ❑ Region STIP Workshop Coordinator

TASK	RESPONSIBLE PARTIES	
	Project Manager	**Design Engineer**
❑ Assemble Information and Produce Draft Concept Report		X
❑ Develop Concept Estimate		X
❑ Finalize Concept Report	X	

Assemble Information and Produce Draft Concept Report

The Design Engineer compiles the information and recommendations from the concept meeting and uses it to produce the Draft Concept Report. The Draft Concept Report contains the Concept Report Summary, Concept Estimate and the work products from previous activities. The Concept Report Summary document contains a suggested order for these documents in the table of contents.

The Concept Report Summary contains:

- ❑ Improvements to be made
- ❑ Summary of critical elements not to be corrected (approved design exceptions)
- ❑ Summary of deficiencies that are recommended not to be corrected and the reasons for the recommendations
- ❑ Project concept cost estimate
- ❑ Input from, feedback to, and commitments made to stakeholders
- ❑ Recommend project parameters and design criteria
- ❑ Pavement design
- ❑ Project schedule (from ePM)

Develop Concept Estimate

Finalize a concept level estimate using the concept report estimating spreadsheet.

Finalize Concept Report

Distribute the draft concept report to all team members to review for completeness and accuracy. The final concept report needs to be signed by the Region Preconstruction Engineer and the Project Manager recommending it for approval. The Report is then submitted to the Region Director who signs and approves the Final Concept Report. Submit a copy to the Region STIP Workshop Coordinator.

Develop Pavement Design # 76C

Deliverables

- ❑ Approved Pavement Design

Distribution

- ❑ Project File
- ❑ Project Manager
- ❑ Region Materials Engineer
- ❑ Engineer for Materials

TASK	RESPONSIBLE PARTY
	Region Pavement Engineer
❑ Pavement Scoping Meeting	X
❑ Testing	X
❑ Select Pavement Type	X
❑ Produce Final Pavement Design Report	X

Pavement Scoping Meeting

Develop a pavement testing strategy, proposed design life, and any additional testing required to complete an approved pavement design. Evaluate potential material sources and additional parameters such as noise consideration or drainage requirements.

Testing

Perform additional site investigation, testing, or both, as needed. Possible tests include:

- ❑ Core and trench for thickness and condition of existing pavement
- ❑ Extraction/gradation on cores
- ❑ Strength and stripping tests
- ❑ Trench for sub base and sub grade samples
- ❑ Concrete pavement evaluation
- ❑ Falling weight deflectometer testing
- ❑ Centerline Soil Survey Report
  - o Soil classification - plastic limit

- Soluble Salts
- Resistivity
- PH

Select Pavement Type

Review preliminary testing and provide the most likely design alternative for both Portland Cement Concrete and Hot Mix Asphalt pavements. Perform a pavement type life-cycle cost analysis comparing both options in accordance with UDOT Pavement Management and Pavement Design manual recommendations. Recommend based on lowest life-cycle cost solution for pavement. Verify pavement type selection is consistent with the corridor plan.

Produce Final Pavement Design Report

This report will include existing pavement condition, pavement construction and maintenance history, recommended pavement type, rehabilitation strategy (reconstruction, major or minor rehabilitation,) life-cycle cost, initial cost estimate, additional project acceptance or verification testing requirements, and material descriptions as needed.

Submit the pavement design recommendation to the Region Materials Engineer for concurrence. Perform cost estimate, develop applicable special provisions and identify pay items to be used in the project. Summarize into a document the following:

- ❑ Construction cost estimate
- ❑ Life-cycle evaluation
- ❑ Additional project acceptance or verification testing requirements
- ❑ Material descriptions as needed
- ❑ Pavement history and condition information
- ❑ Design calculations and assumptions
- ❑ Cost information
- ❑ List of potential issues for the field

Media Relations # 78C

Deliverables

- ❑ Media Relations Form

Distribution

- ❑ Project File
- ❑ Region Public Involvement Coordinator
- ❑ Community Relations Office

TASK	RESPONSIBLE PARTY
	Public Involvement Coordinator
❑ Complete Media Relations Form	X

Complete Media Relations Form

The Public Involvement Coordinator, with the assistance of the Project Manager, reviews the initial project scope and schedule, completes the Media Relations form, and submits the Media Relations form to the Community Relations office.